XLV.—*On the Arrangement of the Brachiopoda.*

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CUVIER established this class of Mollusca as an order when he published the dissection of *Lingula,* and it has been almost universally adopted.

Linnæus, Müller, Pallas, Poli, Blainville, Owen, Philippi and D'Orbigny have made us acquainted with the animals of the other recent genera, and showed how they differ from one another.

Mr. M'Coy in his work on the Fossils of the Carboniferous Limestone, Mr. King in the 'Annals of Natural History,' and more lately M. D'Orbigny in a paper transmitted to the Academy of Sciences, and published in the 'Annales des Sciences Naturelles,' have availed themselves of these materials and proposed an arrangement of the genera of this class into families.

Mr. M'Coy's paper illustrates both the fossil and recent genera, and was an important addition to our knowledge; Mr. King's corrected some of the synonyma of the genera and added some details; M. D'Orbigny's is clever and rapid, and he has evidently availed himself of the labours of both the above-named gentlemen and of Philippi, though, with his usual want of generosity, he has not mentioned their names in any part of his paper, and has given new names to several of his genera, though many of them have long been distinguished by preceding authors.

Not considering the arrangement proposed by these authors as quite satisfactory, I have ventured to suggest the following. Some may be astonished at my proposing to place what they have been in the habit of considering as species of the same genus in different orders and families, but the number of species and forms known appears to me to justify this proceeding. Bronn in his late work gives a list of more than 950 fossil species of this class, many of them having several named varieties.

Synopsis of the Orders.

A. The oral arms recurved and affixed to fixed appendages on the disc of the ventral valve. Shell minutely and closely perforated. ANCYLOPODA.

1. ANCYLOBRACHIA. The oral arms affixed to calcareous plates, forming hoops attached to the hinge-margin of the ventral valve, and prominent in its cavity.

2. CRYPTOBRACHIA. The oral arms sunk into grooves in the convex centre of the inner surface of the ventral valve.

B. The oral arms regularly spirally twisted when at rest. HELICTOPODA.

3. Sclerobrachia. The oral arms supported by a shelly plate arising from the hinge-margin of the ventral valve.

4. Sarcicobrachia. The oral arms fleshy, without any shelly support.

C.? The animal unknown; perhaps Conchifera.

5. Rudistes.

Subclass 1. ANCYLOPODA.

The oral arms not extensile or only at the tip; on fixed shelly supports, or in grooves in the under or ventral valve; the mantle is adherent to the shell, the substance of the shell being pierced with numerous minute perforations, which are pervaded by the processes of the mantle.

Order I. ANCYLOBRACHIA.

The oral arms are attached to two shelly plates arising from the hinder or cardinal edge of the ventral valves; they are recurved and convolute on the inner side of the lamina.

The animals are generally attached to marine bodies by a tendinous peduncle, which passes through a hole in the top of the umbo of the larger or dorsal valve; this peduncle and the hole are sometimes obliterated in the older specimens.

The order only contains a single family.

Fam. 1. TEREBRATULIDÆ,

which is nearly synonymous with the smooth *Terebratula* of Sowerby, the perforated *Terebratula* of Carpenter, the genus *Epithyris* of Phillips and *Terebratula* of King, the family *Terebratulidæ* of M'Coy, and *Cyclothyridæ* of Phillips.

The animal has been described by Linnæus, Pallas, Owen, Blainville, Philippi, D'Orbigny and others.

In some genera the hoops are united together below by a transverse band which is attached to medial longitudinal ridges of the ventral valve, as in *Terebratula* of Retzius = the *Terebratella* of D'Orbigny, as *T. dorsata*; and *Magas*, Sow. In others the hoop forms a ring and is free from the ventral valve, as *Gryphus*, Megerle = *Terebratula*, D'Orb., and *Terebratulina*, D'Orbigny, for *T. vitrea* and *T. caput serpentis*.

D'Orbigny indicates other genera under the names of *Terebrirostris* and *Fissirostris*.

Order II. The CRYPTOBRACHIA

have the oral arms entirely attached in the form of two or more lobed processes sunk into grooves in the disc of the ventral valve. They are generally thick shells. This order also only consists of a single family.

Fam. 1. THECIDÆADÆ.

The animals are described by Philippi and D'Orbigny. The genus *Argiope,* De Longchamps = *Megatheris,* D'Orb. (*Tereb. detruncata*) is attached by a tendon passing out of a very large perforation below the beak of the dorsal valves; Philippi confounds this genus with his *Orthis,* which is different from the *Orthis* of Dalman. *Thecidæa* has the shell attached by the truncated apex of the dorsal valve, or it is free when the apex is produced and entire. De Longchamps, who established the genus *Argiope* in 1839, pointed out the affinity of this genus to *Thecidæa.*

Subclass 2. HELICTOPODA.

The oral arms are elongate, regularly spirally twisted when in repose. The mantle lobes are merely applied to the inner surface of the shell, and the substance of the valves is not pierced with minute perforations, though the surface is sometimes spinulose, the spines being only formed on the edge of the shell while it is being increased in size.

Order III. SCLEROBRACHIA.

The oral arms support a shelly band arising from the hinder or cardinal edge of the ventral valve.

Fam. 1. SPIRIFERIDÆ.

The oral arms very largely developed and supported the whole of their length by a thin shelly? or cartilaginous? spirally twisted plate.

These shells are only known in the fossil state, but the spiral supports of the arms are generally preserved, and may be discovered by sections of the fossil, and are often to be seen in the fractured specimens.

This family is equivalent to the genus *Spirifer* of J. Sowerby the father, the family *Delthyridæ,* M'Coy, who gave some excellent illustrations of the structure, and the *Spiriferidæ* of King. D'Orbigny proposed some genera under the names of *Spiriferina, Spirigera* and *Spirigerina,* according to the direction of the axis of the spiral cones, but it is doubtful if these genera are only new names to those already established.

The *Spirifer* of Sowerby, as reduced by M'Coy, and the *Martinia* of M'Coy, have the hinge as long or longer than the width of the shell. In *Atrypa,* Dalman, and *Athyris,* M'Coy, it is shorter and the shells oblong, rounder behind.

According to the description of Mr. King, the genus *Strigocephalus* would appear to form the passage between this and the next family (Ann. Nat. Hist. xviii. 89).

Fam. 2. RHYNCHONELLIDÆ.

The oral arms are elongate, fleshy, supported at the base by two short, hard, diverging shelly laminæ arising from the hinge-margin of the ventral valve.

They are easily known from the *Terebratulidæ* by the cavity of the shell being without shelly plates, its substance not perforated, and its surface being generally radiately plaited.

Only one species, *T. psittacea,* is known in the recent state: its animal has been described by Prof. Owen.

The family is equivalent to the plaited *Terebratula* of the elder James Sowerby and Von Buch, the non-perforated *Terebratula* of Carpenter, the genus *Hypothyris* of Phillips, and part of the family *Terebratulidæ* of King.

It contains the genus *Rhynchonella* of Fischer and D'Orbigny = *Hypothyris,* Phillips; *Comerophoria,* King; *Uncites,* Defrance;
s/ ? *Trigono~~t~~emus,* Kœnig; *Rhyncora,* Dalman; *Pygope,* Link; *Delthiridæa,* M'Coy; *Pentamerus,* Sowerby.

Order IV. SARCICOBRACHIA.

The oral arms fleshy to the base and without any shelly support, the lower valve without any processes on the hinge-margin or disc, or except sometimes a slight medial longitudinal elevation.

Fam. 1. PRODUCTIDÆ

consist entirely of fossil species, some much resembling those of the former family; but the shells are generally spinose; they are often attached to marine bodies by the surface of the ventral valve, as the genera *Productus,* Sow., *Stropholosia,* King, *Chonetes,* Fischer, *Leptæna* and *Orthis,* Dalman, *Strophonema,* Rafinesque, and *Calceola,* Lamk.

This family comprises Mr. King's *Productidæ, Strophomenidæ* and *Calceolidæ.*

Fam. 2. CRANIADÆ.

Nearly allied to the last, but the upper valve is simply conic like a *Patella,* and the animal is attached by the outer surface of the ventral valve.

The animal has been figured by Müller, Poli and others. It includes the recent genus *Crania* of Retzius, including the *Orbicula* of Lamarck, *Criopus* of Poli. The lower valve of the only recent species I am acquainted with varies greatly in thickness and form according to the position and habitation of the animal. This family in many particulars is allied to *Thecidæadæ.*

Fam. 3. DISCINIDÆ.

The upper valve is conical and patelloid, the lower orbicular, and is attached to marine bodies by a short tendinous peduncle, which passes out through a slit in the hinder part of the disc of the *ventral* valve.

The animal of this genus has been described by Mr. Owen under the name of *Orbicula,* Mr. G. B. Sowerby having some years ago confounded this shell with that genus, which has caused confusion which has existed to this day. The shell was first described by Schumacher as a section of the genus *Crania*: Mr. King, probably misled by this mistake, does not include it in his arrangement. This shell is peculiar, for being a horny rather than a shell texture, it is flexible when moist.

Fam. 4. LINGULIDÆ.

The valves are nearly equal, elongate, and supported by a thick peduncle which comes out between the beaks of the two valves. The shells are covered with a horny periostraca, and in some species the shelly matter is so very thin that the shells are flexible and nearly entirely cartilaginous.

The family contains only a single genus, *Lingula.*

Order V. RUDISTES.

This order has been placed by most modern authors with the Brachiopoda: the proofs of its belonging to this family are not very evident; but as there is no other to which they appear to be more nearly allied, they may as well be retained in this position.

Lamarck, Cuvier, Férussac, and some other authors have regarded some of the genera as belonging to Cephalopoda, and others as bivalves (Conchifera).

Deshayes regards them as more nearly related to *Chama,* the character of the family having been lost by the destruction of the inner coat of the shell during the fossilization of the specimen.

M. D'Orbigny has properly united them into one group under the name of Irregular Brachiopods or *Rudistes,* but he includes with them the genus *Crania,* which is a true Brachiopod.

They form three very distinct families:—

Fam. 1. RADIOLITIDÆ.

The lower valves more or less elongate-conical, fixed; the upper valve conical or spiral, free; the texture of the lower valve cellular or fibrous.

The *Radiolites* has the upper valve flat or conical and cap-like.

The *Caprina,* D'Orb., has a spiral and produced upper valve. The first of these genera has had many names applied to it, but that given by Lamarck has the priority. It has been called *Sphærulites, Ostracites* and *Acardo,* and the cast of the interior cavity has been considered as a genus, under the name of *Birostris* and *Iodamia.*

Fam. 2. HIPPURITIDÆ.

The lower valve is elongate, tapering, subcylindrical, of a solid laminated texture; the upper valve is nearly flat, and pierced with peculiar pores radiating to the circumference with branches diverging to the upper surface.

This family only contains a single genus, *Hippurites,* Lamk., which has also had many other names applied to it, as *Cornucopia, Orthoceratites, Batolites* (or *Batholites*), *Raphanister,* and *Bitubulites.*

Fam. 3. CAPROTINADÆ.

The lower or fixed valve is conical and spirally twisted, and marked internally with prominent ridges or transverse septa; the dorsal or free valve is oblique or spiral. They differ from *Caprina* in the valves not being of a cellular or fibrous texture.

This family contains two genera :—

1. *Caprotina,* D'Orb., which has the cavity of the shell merely marked with internal ridges.

2. *Ichthyosarcolites* has the cavity of the large spiral or involute fixed valve divided transversely by a number of oblique septa; the upper valve is probably like an operculum, but this genus is very imperfectly known.

BIBLIOGRAPHICAL NOTICES.

The Ferns of Britain and their Allies; comprising Equisetaceæ, Filicaceæ, Lycopodiaceæ and Marsileaceæ. By R. DEAKIN, M.D., London. Pp. 139. 8vo. London, 1848.

A Handbook of British Ferns intended as a guide and companion in Fern Culture, and comprising scientific and popular descriptions, with engravings of all the species indigenous to Britain, with remarks on their history and cultivation. By THOMAS MOORE, Curator of the Bot. Garden of the Apothecaries' Company. Pp. 156. 16mo. London, 1848.

OWING chiefly, it is probable, to the publication of Mr. Newman's beautiful work 'A History of British Ferns,' the study of this tribe of plants has taken a firm hold upon the affections of British botanists, and we now hail with delight the appearance of two other illustrated works upon them, as they cannot but tend still further to popularize the subject and lead to a more complete and scientific knowledge of it.